

CLAIMS

We claim:

1. A tubular structure, comprising:
 - an outer surface;
 - an inner surface; and
 - at least one raised rib, integrated with said inner surface or said outer surface, said rib formed by at least one of a layer of prepreg and a strand of a fiber.
2. A tubular structure according to claim 1, wherein the tubular structure is cylindrical.
3. A tubular structure according to claim 1, wherein a cross-section of the tubular structure is at least one of ovoid, triangular, rectangular and hexagonal.
4. A tubular structure according to claim 1, wherein the longitudinal axis of the tubular structure is a straight line.
5. A tubular structure according to claim 1, wherein the longitudinal axis of the tubular structure has at least one bent angle.
6. A tubular structure according to claim 1, wherein said raised rib is oriented from between about 0 and 90 degrees, relative to a longitudinal axis of the tubular structure.
7. A tubular structure according to claim 1, wherein said outer surface, said inner surface and said raised rib are composed of the same material.
8. A tubular structure according to claim 1, wherein said raised rib comprises a rib material different than the material of said outer surface or said inner surface.

9. A tubular structure according to claim 8, wherein said rib material is at least one of fiberglass, resin, copper, aluminum, steel, titanium, plastic and ceramic.

10. A tubular structure according to claim 8, wherein said rib material is attached to said outer surface or said inner surface by a composite veil layer of material that is the same as the material from which the rest of the tubular structure is made.

11. A tubular structure according to claim 1, wherein said raised rib defines a hollow cavity.

12. A tubular structure according to claim 11, wherein said hollow cavity encloses a sensing actuator.

13. A method for manufacturing a tubular structure, comprising:
manufacturing an expandable, elastomeric tube with at least one indented groove on its outer surface;
wrapping said elastomeric tube with at least one strand of a fiber, such that said at least one strand lies within said at least one indented groove,
wrapping said elastomeric tube and said at least one strand with layers of composite prepreg;
placing said elastomeric tube, said at least one strand and said layers of composite prepreg together into a mold for fabricating the tubular structure;
pressurizing said elastomeric tube;
inflating said elastomeric tube;
heating said elastomeric tube, said at least one strand and said layers of composite prepreg;
cooling said elastomeric tube, said at least one strand and said layers of composite prepreg; and
removing said elastomeric tube, said at least one strand and said layers of composite prepreg from said mold.

14. The method according to claim 13, wherein said elastomeric tube is composed of a rubber-like material.

15. The method according to claim 13, wherein said elastomeric tube is composed of a thermoplastic polymer.

16. The method according to claim 13, further comprising placing a mandrel inside said elastomeric tube, said at least one strand and said layers of prepreg and rolling said mandrel, said elastomeric tube, said at least one strand and said layers of prepreg on a horizontal surface to begin consolidation of said layers of prepreg.

17. The method according to claim 16, further comprising removing said mandrel before placing said elastomeric tube, said at least one strand and said layers of prepreg together into said mold.

18. The method according to claim 13, further comprising removing said elastomeric tube from said at least one strand and said layers of prepreg after removing said elastomeric tube, said at least one strand and said layers of prepreg from said mold.

19. The method according to claim 13, further comprising removing said at least one strand from said layers of prepreg after removing said elastomeric tube, said at least one strand and said layers of prepreg from said mold.

20. A method for manufacturing a tubular structure, comprising:
 manufacturing an expandable, elastomeric tube with at least one indented groove on its outer surface;
 wrapping said elastomeric tube with at least one strand of a fiber, such that said at least one strand lies within said at least one indented groove,
 wrapping said elastomeric tube and said at least one strand with layers of composite prepreg;

8 placing a mandrel inside said elastomeric tube, said at least one strand and said
9 layers of prepreg;
10 rolling the mandrel, said elastomeric tube, said at least one strand and said layers of
11 prepreg on a horizontal surface to begin consolidation of said layers of prepreg;
12 removing said mandrel from inside said elastomeric tube, said at least one strand
13 and said layers of prepreg;
14 placing said elastomeric tube, said at least one strand and said layers of composite
15 prepreg together in a mold for fabricating the tubular structure;
16 pressurizing said elastomeric tube;
17 inflating said elastomeric tube;
18 heating said elastomeric tube, said at least one strand and said layers of composite
19 prepreg;
20 cooling said elastomeric tube, said at least one strand and said layers of composite
21 prepreg; and
22 removing said elastomeric tube, said at least one strand and said layers of
23 composite prepreg from the mold.

21. The method according to claim 20, wherein said elastomeric tube is composed of a rubber-like material.

22. The method according to claim 20, wherein said elastomeric tube is composed of a thermoplastic polymer.

1 23. A method for manufacturing a tubular structure, comprising:
2 manufacturing an expandable, elastomeric tube with a smooth surface;
3 wrapping said elastomeric tube with at least one strand of a fiber, such that said at
4 least one strand lies within said at least one indented groove,
5 wrapping said elastomeric tube and said at least one strand with layers of
6 composite prepreg;
7 placing said elastomeric tube, said at least one strand and said layers of composite

8 prepreg together in a mold for fabricating the tubular structure, said mold having at least one
9 indented groove on its inner surface;
10 pressurizing said elastomeric tube;
11 inflating said elastomeric tube;
12 heating said elastomeric tube, said at least one strand and said layers of composite
13 prepreg;
14 cooling said elastomeric tube, said at least one strand and said layers of composite
15 prepreg; and
16 removing said elastomeric tube, said at least one strand and said layers of
17 composite prepreg from said mold.

24. A method for manufacturing a tubular structure, comprising:
 manufacturing an expandable, elastomeric tube with a smooth surface;
 wrapping said elastomeric tube with at least one strand of a fiber, such that said at
1 least one strand lies within said at least one indented groove,
 wrapping said elastomeric tube and said at least one strand with layers of
2 composite prepreg;
 placing a mandrel inside said elastomeric tube, said at least one strand and said
3 layers of prepreg;
 rolling the mandrel, said elastomeric tube, said at least one strand and said layers of
4 prepreg on a horizontal surface to begin consolidation of said layers of prepreg;
 removing said mandrel from inside said elastomeric tube, said at least one strand
5 and said layers of prepreg;
 placing said elastomeric tube, said at least one strand and said layers of composite
6 prepreg together in a mold for fabricating said tubular structure, said mold having at least one
7 indented groove on its inner surface;
 pressurizing said elastomeric tube;
8 inflating said elastomeric tube;
 heating said elastomeric tube, said at least one strand and said layers of composite
9 prepreg;
10 removing said elastomeric tube, said at least one strand and said layers of composite
11 prepreg from said mold.

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
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